

BATHTUB DOOR SEAL AND LATCH

BACKGROUND OF THE INVENTION

[001] The present invention relates to bathtubs having doors to facilitate entry and exit and, more particularly, to an arrangement for providing seals at the doors and a method of making the doors with seals.

[002] Bathtubs are known that have openings in a side to facilitate entry and exit, and doors to selectively close the openings in a watertight manner. In some known doors, the seals are secured only by adhesive. As a result, there have been problems with the seals being pulled off of the doors or of the adhesive deteriorating from cleaning agents or other causes. In addition, the users of tubs having doors are often handicapped or elderly, some of who have difficulty in operating the mechanisms which are used to secure the door in a watertight condition.

SUMMARY OF THE INVENTION

[003] By the present invention, a seal for a bathtub door is releasably retained in a groove by a mechanical interlock. More specifically, the groove has an opening having a first width transverse to the length of the groove and a main portion having a second width transverse to the length of the groove, wherein the second width is greater than the first width. The seal has a base portion having a third width greater than the first width. Furthermore, the base portion has a first condition in which it is unable to pass through the opening of the groove, and a second condition in which it is able to pass through the opening of the groove. In the first condition, the

base portion is relaxed, and in the second condition, the base portion is in tension in the longitudinal direction of the seal.

[004] The door is held closed in a watertight manner by a latch pivotally mounted on either the door or the side of the bathtub, wherein the latch has a contacting surface beveled in two directions. As a result, the latch cams the door toward the side of the bathtub in all positions in which the contacting surface makes contact with either the side of the bathtub or the door, whichever the latch is not mounted on. The latch has a curved, tapering shape that makes it well suited to be grasped and/or manipulated by hand, including by the hands of handicapped or arthritic persons who are limited in the positions to which they can form their hands.

[005] The groove is formed during the molding of the door by a groove-forming element releasably attached to the mold. When the door is removed from the mold, the groove-forming element separates from the mold and remains in the groove, but is removable from the groove by the application of tension on the groove-forming element in the longitudinal direction.

BRIEF DESCRIPTION OF THE DRAWINGS

- [006] Fig. 1 is an isometric view of a bathtub according to the present invention;
- [007] Fig. 2 is an elevation from the inside of a portion of a bathtub of Fig. 1, showing a tub wall and door;
- [008] Fig. 3 is a top view of the bathtub portion of Fig. 2;
- [009] Fig. 4 is a front elevation of a latch for the door of the bathtub of Fig. 1;
- [0010] Fig. 5 is a bottom plan view of the latch of Fig. 4;
- [0011] Fig. 6 is a right end view of the latch of Fig. 4;

[0012] Fig. 7 is an exploded schematic view of a portion of a bathtub door according to the present invention and a portion of a mold used to form the door;

[0013] Fig. 8 is a partial cross-section of a door in a mold having a mold forming element, in accordance with the present invention; and

[0014] Fig. 9 is an enlarged cross-section of a door with a seal in place, in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] As can be seen from Figs. 1-3, a bathtub according to the present invention, which is designated generally by the reference numeral 10, has a side 12 defining an opening to facilitate entry to and exit from the bathtub, and a door 14 pivotally mounted on the side 12 by a hinge 16. The hinge mounting enables the door 14 to pivot between an open position allowing entry to and exit from the bathtub 10, as shown in Fig. 1, and a closed position, as shown in Figs. 2 and 3, in which entry and exit are inhibited and the door 14 closes the opening in the side 12 in a watertight manner. For sealing purposes, a recess 17 is defined in the wall of the tub at the opening, along both sides and at the bottom of the opening. The recess 17 is defined in part by a flange with which a seal 18 on the door makes watertight engagement. A latch 20 is pivotally mounted on an inside surface of the wall 12 adjacent to the recess 17. The latch 20 is movable from a first position, shown in solid lines in Fig. 1, in which the door 14 is free to open, to a second position, shown in dashed lines, in which the latch 20 compresses the seal 18, thereby holding the door 14 in watertight engagement against the tub side 12.

[0016] As can be appreciated from Figs. 4-6, the latch 20 has a front side 22, a rear side 24, a top 26 and a bottom 28. The latch 20 is mounted for pivoting about a pivot axis P, the latch

having a length extending radially with respect to the pivot axis P and a width extending perpendicular to the length. The rear side 24 faces the door 14 and the side 12 of the bathtub on which the latch is mounted. The rear side 24 contains a first portion 30 defining a plane and a second portion having a contacting surface 32 that is beveled away from the plane along the length and the width. The width tapers from the pivot axis P to an end of the latch 20 radially remote from the pivot axis, and the handle curves slightly along its length. The front side 22 curves from the top 26 to the bottom 28. The curving and tapering allow an arthritic or otherwise crippled hand, the tight closing of which might not be possible, to move along the latch 20 until it finds a portion having the proper dimensions for the partially closed hand to grasp. Other mounting arrangements are suitable for the latch 20. For example, the latch 20 can be mounted on an exterior surface of the door 14 in a position to selectively engage an outside surface of the tub side 12.

[0017] The door 14 can be molded in a mold 40, a portion of which is illustrated in Fig. 7. The mold 40 has contours that are complementary to the contours of the door 14. The mold 40 has a bottom 42 and a side wall composed of a first upstanding portion 44, an outwardly extending flange 46 and a second upstanding portion 48. The flange 46 and the upstanding portions 44 and 48 extend along at least three sides of the mold 40 to form at least the two sides and bottom of the door 14. A groove 50 is defined in the flange 46, the groove extending for the entire length of the flange. As can be seen from Fig. 8, the groove 50 has sidewalls 52, 54 that are angled slightly outward from the vertical. Each sidewall contains a ridge 56 projecting toward the center of the groove slightly above a bottom 58 of the groove.

[0018] The groove 50 in the mold 40 receives a groove-forming element 60 that forms a groove in the door 14 as the door is molded in the mold. The groove-forming element 60 has a

shank portion 62 received in the groove 50, the shank portion having flexible fins 64 that extend laterally outward and upward from the shank portion 62. The fins 64 are dimensioned to extend, in their relaxed state, beyond the sidewalls 52, 54 of the groove 50. As a result, the fins 64 are resiliently deformed by the sidewalls 52, 54, thereby centering the shank portion 62. In addition, the lower fins 64 engage the undersides of the ridges 56, thereby releasably retaining the groove-forming element 60 in the groove 50.

[0019] The groove-forming element 60 forms a groove 70 in the door 14 along three sides of the perimeter of the door 14. The groove 70 has a shape that is complementary to a groove-forming portion 66 of the groove-forming element 60. In the illustrated embodiment, the groove 70 is circular in transverse cross section. Of course, when the door 14 is first molded, the seal 18 shown in Fig. 6 is not in the groove 70. Instead, the groove-forming element 60 fills the groove 70. The groove 70 has an opening 72 that has a first width and a main portion 74 that has a second width that is greater than the first width of the opening 72. As a result, once the door 14 has solidified, the groove-forming element 60 is securely retained in the groove 70 with greater force than the groove-forming element is retained in the groove 50 of the mold. Therefore, when the door 14 is removed from the mold 40, the groove-forming element 60 separates from the groove 50 of the mold 40 and stays with the door 14.

[0020] At least the groove-forming portion 66 of the groove-forming element 60 is made of a material whose dimension in at least one transverse direction decreases as tension is applied in a longitudinal direction. As a result, when the groove-forming element 60 is tensioned in the longitudinal direction, the dimension of the groove-forming portion 66 in a direction transverse to the length and parallel to the width of the groove 70 decreases. Consequently, when the groove-forming element 60 is in tension in the longitudinal direction, it can be removed from the

groove 70 in a direction straight through the opening 72 of the groove 70. It is not necessary that the dimension of the groove-portion forming 66 parallel to the opening 72 of the groove 70 decrease to a dimension smaller than the width of the opening 72. The longitudinal tension merely has to decrease the width of the groove-forming portion 66 enough that the groove-forming portion can deform sufficiently to move through the opening 72 of the groove 70. In the absence of such longitudinal tension, the groove-forming portion 66 is unable to deform sufficiently to move through the opening 72. Suitable materials for the groove-forming element 60 include silicones.

[0021] After the groove-forming element 60 has been removed from the groove 70, the groove is available to receive the seal 18, which makes watertight engagement with the side 12 of the tub 10. The groove 70 and the seal 18 extend along the bottom and both sides of the door 14 at the perimeter of the door. As can be seen in Fig. 9, the seal 18 has a base portion 80 to be received and retained in the groove 70 and a sealing portion 82 extending along the length of the base portion and positioned outside the groove, the base portion and the sealing portion being connected in one piece by a neck portion 84. The base portion 80 has a generally circular transverse cross-section and a width that is sufficiently greater than the width of the opening 72 of the groove 70 that, in its relaxed, untensioned condition, the base portion is unable to pass through the opening 72 of the groove 70. This is true despite deformability in the material of which the base portion is made. However, when tension is applied in the longitudinal direction of the base portion 80, the base portion is able to move through the opening 72 of the groove and enter the main portion 74, where it is retained after the longitudinal tension has been removed. As with the groove-forming element 60, the width of the base portion 80 of the seal 18 need not decrease to a width less than the width of the opening 72 of the groove 70. It need only decrease

sufficiently that the base portion 80 can deform sufficiently to pass through the opening 72 of the groove 70. It is preferred that an adhesive 86 also be used to secure the base portion 80 of the seal 18 in the groove 70.

[0022] It will be apparent to those skilled in the art and it is contemplated that variations and/or changes in the embodiments illustrated had described herein may be made without departure from the present invention. For example, the groove can be provided in the side of the tub, around the door opening, and the seal can be secured therein for engagement with the door. As another example, the bevels can be omitted from the contacting surface of the latch and, instead, a beveled member can be provided on the side of the tub for engagement with an unbeveled contacting surface of the latch. In such an arrangement, the bevel on the beveled member can extend in just one direction, rather than two. Furthermore, it is understood that, if the tub door is hinged along a side opposite to the one hinged in the embodiment illustrated, a latch can be used that is a mirror image of the latch of the illustrated embodiment. Accordingly, it is intended that the foregoing description is illustrative only, not limiting, and that the true spirit and scope of the present invention will be determined by the appended claims.